JC940 U.S. PTO 08/11/99

S&H Form: PTO/SB/05 (12/97)

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No. 826.1559/JDH

First Named Inventor or Application Identifier:

Katsuhito FUJIMOTO, et al.

Express Mail Label No.

JC940 U.S. PTO 09/372037 08/11/99

APPLICATION ELEMENTS *See MPEP chapter 600 concerning utility patent application contents.*	*ADDRESS TO:* **Assistant Commissioner for Patents Box Patent Application Washington, DC 20231**

1. [X] Fee Transmittal Form
2. [X] Specification, Claims & Abstract ..... [Total Pages: 40]
3. [X] Drawing(s) *(35 USC 113)* ..... [Total Sheets: 20]
4. [X] Oath or Declaration ..... [Total Pages: 3]
   a. [X] Newly executed (original or copy)
   b. [ ] Copy from a prior application (37 CFR 1.63(d)) *(for continuation/divisional with Box 17 completed)*
      i. [ ] DELETION OF INVENTOR(S)
      Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
5. [ ] Incorporation by Reference (usable if Box 4b is checked)
   The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
6. [ ] Microfiche Computer Program *(Appendix)*
7. [ ] Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
   a. [ ] Computer Readable Copy
   b. [ ] Paper Copy (identical to computer copy)
   c. [ ] Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. [X] Assignment Papers (cover sheet & document(s))
9. [ ] 37 CFR 3.73(b) Statement *(when there is an assignee)* [ ] Power of Attorney
10. [ ] English Translation Document *(if applicable)*
11. [ ] Information Disclosure Statement (IDS)/PTO-1449 [ ] Copies of IDS Citations
12. [ ] Preliminary Amendment
13. [X] Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
14. [ ] Small Entity Statement(s) [ ] Statement filed in prior application, status still proper and desired.
15. [X] Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
16. [ ] Other:

17. If a CONTINUING APPLICATION, *check appropriate box and supply the requisite information:*

[ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) of prior application No: ___/_____

18. CORRESPONDENCE ADDRESS

STAAS & HALSEY
Attn: James D. Halsey, Jr.
700 Eleventh Street, N.W., Suite 500
Washington, DC 20001

Telephone: (202) 434-1500
Facsimile: (202) 434-1501

© 1997 Staas & Halsey

APPLICATION FOR

UNITED STATES LETTERS PATENT

SPECIFICATION

Inventor(s): Katsuhito FUJIMOTO and Hiroshi KAMADA

Title of the Invention: COLOR DOCUMENT IMAGE RECOGNIZING APPARATUS

COLOR DOCUMENT IMAGE RECOGNIZING APPARATUS

Background of the Invention

Field of the Invention

The present invention relates to a recognition technology of color document images.

Description of the Related Art

A document image recognizing apparatus executes an encoding process by recognizing characters in a document image when the document image is inputted. Recently a product to which a binary document image can be inputted has been developed. Recently the use of an image filing device has been widespread, and demand for recognizing an image which is filed by such a device when the image is inputted to a document image recognizing apparatus, has been increasing. A color document image recognizing apparatus also targets the recognition of color document images and gray scale document images.

As personal computers are widespread and information communications networks have improved, many electronically filed documents have appeared. However, the major medium of information distribution is still paper documents, and there are many existing

paper documents. Under these circumstances, demand for a document image recognizing apparatus which can convert a paper document into an electronically filed document and edit the conversion result, has been increasing. In particular, since many gray scale documents and color documents contain pictures, demand for an apparatus such that can recognize not only binary documents, but also gray scale documents and color documents, has been increasing.

If an input document image is not a binary image, but a gray scale image or color image, a conventional color document recognizing apparatus binary-codes the lightness element of each pixel using a constant threshold, obtains a binary image with one of two kinds of values, that is, a value indicating that each pixel is located in a plotting area, such as a ruled line, stroke of a character/drawing, etc., and a value indicating that each pixel is located in a background area, and performs document recognition based on the obtained binary image.

Fig. 1 shows the configuration of a conventional color document image recognizing apparatus.

If an input document image 2201 is a color image, a gray scale image extracting unit 2202 outputs a gray scale image by extracting the gray scale value of a

lightness element, etc., for each pixel.

When a gray scale image is inputted, a constant threshold binary-coding unit 2203 obtains a binary image by executing a binary-coding process for the inputted gray scale image using a constant threshold. This threshold is designated and inputted from the outside, or is obtained by computing the pixel value of a gray scale image, such as Otsu's binary-coded threshold (see Journal of the Institute of Electronic Information and Communication J63-D, No.4 (1980), 349-356).

A local binary-coding unit 2204 obtains a binary image representing a finer plotting area by obtaining and binary-coding the variable threshold of each pixel in the plotting area of the binary image which is outputted by the constant threshold binary-coding unit 2203 using the pixel value of an area several times as large as a character stroke or of about half the size.

A binary image recognizing unit 2205 recognizes the binary image and outputs a recognition result 2206.

The object of the local binary-coding unit 2204 is to judge the binary image which is obtained from a lightness image using a single threshold, such as

Otsu's binary-coded threshold, and to be the roughly obtained plotting area of the inputted color document image and to obtain a finer plotting area by performing finer binary-coding for each pixel of the rough plotting area using a variable threshold. A simpler configuration can also be considered and which is not provided with a local binary-coding unit 2204 and in which the binary image outputted by the constant threshold binary-coding unit 2203 is inputted to the binary image recognizing unit 2205 without modification.

However, the conventional color document image recognizing apparatus shown in Fig. 1 has a weak point in that if there are two or more background colors or plotting colors of a document in an input color document, or if gradation is applied to a background color or plotting color, a part of the plotting area of the input color document becomes a background area or a part of the background area becomes a plotting area in the generated binary image, and thus recognition accuracy is reduced.

The conventional color document image recognizing apparatus is characterized by binary-coding a gray scale image with the constant threshold binary-coding unit 2203 using a constant threshold and utilizing a

binary image in which the plotting area of the input color document is roughly extracted in a subsequent process. For this reason, if there are two or more background colors or plotting colors of a document in an input color document, or if gradation is applied to a background color or plotting color, the relationship between the size of the pixel value of the background area and the pixel value of the plotting area of the gray scale image is not always constant. Therefore, if the gray scale image is binary-coded using a single threshold, a part of the plotting area of the input color document becomes a background area or a part of the background area becomes a plotting area in the generated binary image.

If binary-coding using a constant threshold is not performed and local binary-coding is performed for all the pixels of a gray scale image, a different threshold is used for each pixel, and if the entire neighborhood has almost the same background color or plotting color, noise in the gray-white-flecked state occurs in which the background color and plotting color are finely mixed. For this reason, binary-coding using a constant threshold is introduced in a preceding stage to limit a target to be locally binary-coded to the neighborhood of a plotting area

and to prevent the gray-white-flecked noise from occurring, which becomes the cause of the problem described above.

Summary of the Invention

The background of the present invention has been described above, and an object of the present invention is to be able to distinguish a background area from a plotting area even if there are two or more background colors or plotting colors of a document in an input color document, or if gradation is applied to a background color or plotting color.

In the present invention, the aggregate of partial areas of a single background color and single plotting color covering the plotting area of an input color document image is obtained, a partial binary image is generated by performing binary-coding using a prior art for each partial area, and a binary image of an entire gray scale image is constituted by combining the partial binary images.

In order to obtain the partial area of a single background color and single plotting color, partial areas, such as the neighborhood area of a character with an almost uniform background color and an almost uniform plotting color are extracted by extracting the

outline of the plotting area of an input color document image using edge extraction and by combining closely located edge pixels.

If there are two or more background colors or plotting colors of a document in an input color document or if gradation is applied to a background color or plotting color, a target to be binary-coded using a constant threshold is the partial area of a single background color and single plotting color. Therefore, the present invention has an effect such that a color document image can be accurately binary-coded and recognized.

Brief Description of the Drawings

The other objects and features of the present invention will be more apparent to a person having ordinary skill in the art from the following detailed description in conjunction with the accompanying drawings, in which:

Fig. 1 shows the configuration of a conventional color document image recognizing apparatus.

Fig. 2 shows the configuration of a color document image recognizing apparatus, which is a preferred embodiment of the present invention.

Fig. 3 shows an example of the first

configuration of a partial area extracting unit.

Fig. 4 shows an example of the second configuration of a partial area extracting unit.

Fig. 5 shows an example of the third configuration of a partial area extracting unit.

Fig. 6 shows an example of the fourth configuration of a partial area extracting unit.

Fig. 7 shows an example of the first configuration of a partial image binary-coding unit.

Fig. 8 shows an example of the second configuration of a partial image binary-coding unit.

Fig. 9 shows an example of the third configuration of a partial image binary-coding unit.

Fig. 10 shows an example color document (No. 1).

Fig. 11 shows an example binary-coding result according to a conventional apparatus (No. 1).

Fig. 12 shows an example partial area extraction according to a preferred embodiment of the present invention (No. 1).

Fig. 13 shows an example binary-coding result according to a preferred embodiment of the present invention (No. 1).

Fig. 14 shows an example color document (No. 2).

Fig. 15 shows an example binary-coding result according to a conventional apparatus (No. 2).

Fig. 16 shows an edge strength image after edge extraction according to a preferred embodiment of the present invention.

Fig. 17 shows an edge binary image according to a preferred embodiment of the present invention.

Fig. 18 shows the contracted image of an edge binary image according to a preferred embodiment of the present invention.

Fig. 19 shows an image after removing noise from a contracted image according to a preferred embodiment of the present invention.

Fig. 20 shows an image after ruled-line removal according to a preferred embodiment of the present invention.

Fig. 21 shows an example partial area extraction according to a preferred embodiment of the present invention (No. 2).

Fig. 22 shows an example binary-coding result according to a preferred embodiment of the present invention (No. 2).

Description of the Preferred Embodiments

Fig. 2 shows the configuration of a color document image recognizing apparatus in a preferred embodiment of the present invention.

This preferred embodiment is provided with a gray scale image extracting unit 102 and a multi-code image binary-coding unit 103. An input document image 101 is inputted from an input circuit to the gray scale image extracting unit 102. The input documemt image 101 is a color image or gray scale image.

If the input document image 101 is a color image, after the gray scale image extracting unit 102 converts the input document image 101 to a gray scale image, the multi-code image binary-coding unit 103 converts the gray scale image to a binary image in which each pixel represents either a background area or plotting area in the gray scale image.

If the input document image 101 is a gray scale image, the multi-code binary-coding unit 103 converts the input document image 101 to a binary image and outputs the binary image.

A binary image recognizing unit 107 recognizes the binary image outputted by the multi-code image binary-coding unit 103, and outputs an electronically coded recognition result 108.

The multi-code image binary-coding unit 103 includes a partial area extracting unit 104, a partial image binary-coding unit 105 and a binary image combining unit 106. The partial area extracting unit

104 extracts one or more partial areas in the gray scale image. The partial image binary-coding unit 105 executes a binary-coding process for each partial area of the gray scale image. The binary image combining unit 106 constitutes a binary image of the entire gray scale image by combining the one or more partial binary images.

In the conventional apparatus shown in Fig. 1, the entire gray scale image is collectively binary-coded by the constant threshold binary-coding unit 2203. On the other hand, this preferred embodiment is configured in such a way that a binary-coding process is finely executed for each partial area which is extracted by the partial area extracting unit 104 in the multi-code image binary-coding unit 103. The partial image binary-coding unit 105 for processing a partial image in which input information is limited to a partial area in the gray scale image can also be provided with the functions possessed by the constant threshold binary-coding unit 2203 and the local binary-coding unit 2204 in the conventional apparatus.

For a concrete method for extracting a gray scale image from the input document image 101, that is, a color document in the gray scale image extracting unit

102, a technology for generating a gray scale image by outputting either the lightness element, saturation element or hue element of a color pixel, one of the three primary colors, that is, red, green or blue, or a value which is obtained by assigning the elements or primary colors in a certain calculation expression, as a gray scale value, can be considered. Since the lightness element can store information possessed by many color documents, the lightness is the most typical element that uses a gray scale image which can be extracted.

The partial area extracting unit 104 of the multi-code image binary-coding unit 103 extracts the aggregate of partial areas of a single background color and single plotting color covering the plotting area in the input document image 101, that is, a color document. For the concrete method of this process, a method of extracting one or more partial areas in which both the background color and plotting color in a gray scale image have nearly constant gray scale values can be considered. In this case, a method using a rectangular area of which the shape of the partial area can be easily described can also be considered.

More specifically, a method in which the partial area extracting unit 104 executes an edge extracting

process for a gray scale image and extracts one or more partial areas using the obtained edge strength image or edge direction image, can be considered. In the edge extracting process, a Zobel filter or Laplacian filter, which are well known in the field of image processing, can be used.

Furthermore, a method in which the partial area extracting unit 104 obtains an edge binary image representing the outline of a plotting stroke by executing an edge extracting process and extracts one or more partial areas based on the edge binary image, can be considered. A method of obtaining an edge binary image by executing a binary-coding process for the edge strength image of a gray scale image using a general binary-coding method, such as Otsu's binary-coding when the edge binary image is obtained, can also be considered. Alternatively, a method of obtaining an edge binary image of which the edge outline is somewhat contracted by obtaining a temporary edge binary image by executing a binary-coding process for the edge strength image of a gray scale image using a general binary-coding method, etc., shifting each of the edge pixels of the temporary edge binary image several pixels in the forward or backward direction of an edge direction

image and generating an edge image of which the outline formed by the edge pixels is contracted when the edge binary image is obtained, can be considered.

Furthermore, a method in which the partial area extracting unit 104 obtains the coupling element of the edge pixel of an edge binary image and each partial area is obtained based on each coupling element, can also be considered. In this case, the partial area can also be more simply described by designating the circumscribed rectangle of the coupling element for its partial area. Alternatively, a method of designating the overlapping rectangle of a circumscribed rectangle of the coupling element of the edge pixel of an edge binary image for its partial area can be considered.

Fig. 3 shows an example first configuration of a partial area extracting unit 104.

First, an edge extracting process is executed for a gray scale image using a Zobel filter, etc., and an edge strength image is extracted (201 in Fig. 3).

Then, a binary-coding process is executed for the edge strength image using a constant threshold based on Otsu's binary-coding method, etc., and an edge binary image is extracted (202 in Fig. 3). This edge binary image has the outline of the plotting area of

the input document image, that is, a color document as a plotting area.

Then, the aggregate of the coupling elements of the plotting area of the edge binary image is extracted using a technique, such as labeling, etc., and the aggregate of the circumscribed rectangles of the coupling element are outputted as the aggregate of partial areas (203 in Fig. 3).

In the case of a color document in which a plotting area is composed of only characters, portions closely located with the outlines used as a center, of the plotting area of an input document image 101 is considered to have a nearly uniform background and a nearly uniform plotting color. For this reason, the partial area obtained by the partial area extracting unit 104 having this configuration can designate a gray scale partial image suited to be inputted to the partial image binary-coding unit 105 which is based on a prior art.

Fig. 4 shows an example of the second configuration of a partial area extracting unit 104.

In this example configuration, an edge image contracting process (301 in Fig. 4) is inserted between the edge image binary-coding process (201) and the edge coupling element extracting process (203) of

the first example configuration shown in Fig. 3.

In this process, since each edge pixel of an edge binary image is shifted several pixels in the forward or backward direction of the edge direction image and the outline of the image formed by edge elements is contracted , a new edge binary image of which the edge outline is somewhat contracted can be generated.

Then, the aggregate of the coupling elements of the plotting area of the edge binary image is extracted and the aggregate of the circumscribed rectangles of the coupling element are outputted as the aggregate of partial areas (203).

In this way, by adding the contraction process of an edge image, the overlapping of the outlines of a plurality of characters can be prevented and thus the coupling element of an edge can be prevented from becoming large. As a result, in the case of a color document in which a plotting area is composed of only characters, closely located with the outlines used as a center, of the plotting area of an input document image 101 can have a more uniform background and a more uniform plotting color.

Furthermore, a method in which the partial area extract unit 104 judges an extremely long outline from the outlines composing the edge pixel in the edge

binary image to be a ruled line, and removes the outline and extracting a partial area based on an edge binary image consisting of only the remaining edge pixels, can be considered. Alternatively, a method of judging outlines which continue with a certain degree of length in a lateral or vertical direction, from the outlines composing of the edge pixel in the edge binary image, to be ruled lines, removing the outlines and extracting a partial area based on the edge binary image composed only of the remaining edge pixels, can be considered.

Fig. 5 shows an example of the third configuration of a partial area extracting unit 104.

In this example configuration, a ruled-line removing process (401 in Fig. 5) is inserted between the edge image contracting process (301) and the edge coupling element extracting process (203) of the second example configuration shown in Fig. 4.

In this process, edge outlines with a certain degree of length or an unspecified degree of length in a lateral or vertical direction in the edge binary image of which the edge outline is somewhat contracted are judged to be ruled lines and are removed.

Then, the aggregate of the coupling elements of the plotting area of the edge binary image is

extracted, and the aggregate of the circumscribed rectangles of the coupling element are outputted as the aggregate of partial areas (203).

By adding such a ruled-line removing process, the edge pixels composing a long outline which is generated in the ruled lines of a table and on the boundary of two background areas, can be removed in a color document composed of not only characters but also ruled lines and a color document in which background areas are set aprat. Therefore, a large partial area, such as an edge coupling element obtained from a long outline can be prevented from being extracted. For this reason, a partial area with two or more background colors or plotting colors may be difficult to be outputted, the aggregate of partial areas covering a text area can be obtained in a color document containing a table composed of not only characters but also ruled lines and a color document in which background areas are indented, and thus a high-accuracy binary image can be obtained for a text area.

Furthermore, a method in which the partial area extracting unit 104 judges an extremely short outline to be a noise removes the extremely short outline from the outlines composing the edge pixel in an edge

binary image, and extracts a partial area based on the edge binary image composed of only the remaining edge pixels, can also be considered.

Fig. 6 shows an example of the fourth configuration of a partial area extracting unit 104.

In this example configuration, a noise removing process (501 in Fig. 6) is inserted between the edge image binary-coding process (201) and the edge image contracting (303) in the third example configuration shown in Fig.5.

In this process, the noise removing process described above is executed for the edge binary image.

By adding such a noise removing process, noise which is generated by strike-through or disturbance at the time of the input of an input document image 101 and wrongly extracted by edge extraction, can be removed, and thus a partial area with a more uniform background color and a more uniform plotting color can be outputted.

Furthermore, if the partial area extracting unit 104 executes a ruled-line removing process for the outlines composing the edge pixel in an edge binary image, a method of storing and outputting the removed ruled line as another ruled-line binary image can also be considered. Alternatively, a method in which the

binary image combining unit 106 computes the logical OR between the generated binary image and the stored ruled-line binary image, and outputs the obtained binary image, can be considered. By using this method, a good binary image can be combined for a color image containing drawings and characters composed of tables and strokes too, and thus high-accuracy document recognition can be obtained.

The partial image binary-coding unit 105 of the multi-code image binary-coding unit 103 generates one or more partial binary images by executing a binary-coding process for a gray scale partial image corresponding to each partial area extracted by the partial area extracting unit 104.

For a concrete method for this process, a variety of techniques which are suited to a document image with a single background color and a single plotting color, like a binary-coding function which is also used in the conventional apparatus, can be considered.

Fig. 7 shows an example of the first configuration of a partial image binary-coding unit 105.

In this example configuration, since the partial image binary-coding unit 105 executes a binary-coding process using a constant threshold, such as Otsu's

binary-coding threshold, etc., (601 in Fig. 7) for the designated partial area of a gray scale image, a partial binary image can be obtained. For the constant threshold, the linear sum of the mean value, standard deviation and distribution of the pixel value of the designated partial area can also be used. An example of this is shown in equation 1. A general process parameter is a constant.

[Equation 1]

Threshold = Mean value of all pixel values + General process parameter $\times$ Standard deviation of all pixel values

As shown in the following equation 2, the standard deviation can be obtained using the distribution. As shown in the following equation 3, the distribution can be obtained using the mean value and square mean value.

[Equation 2]

Standard deviation = $(\text{Distribution})^{1/2}$

[Equation 3]

Distribution = Square mean value - $(\text{Mean value})^2$

Fig. 8 shows an example of the second configuration of a partial image binary-coding unit 105.

In this example configuration, after the partial

image binary-coding unit 105 roughly extracts a plotting area in the same way as in Fig. 7 (601), the partial image binary-coding unit 105 executes a local binary-coding process to obtain a variable threshold for each pixel in the plotting area (701 in Fig. 8), a partial binary image can be obtained. For the variable threshold used in this local binary-coding process, the linear sum of the mean value, standard deviation and distribution of a pixel value in a local area containing the pixel to be binary-coded for a gray scale partial image corresponding to the partial area can also be used. For example, a threshold can be calculated using the following equation 4 within a local range for each pixel (a square area with a focussed pixel in the center). A local binary-coding parameter is a constant.

[Equation 4]

Threshold value = Mean value of gray scale pixel values in local area + Local binary-coding parameter × Standard deviation of gray scale pixel value

By using the partial image binary-coding unit 105 according to the second example configuration, partial binary-coding more resistant to the change of the background color or character color in the partial area than the first example configuration can be

performed, and thus more accurate color document recognition can be realized.

Fig. 9 shows an example of the third configuration of a partial image binary-coding unit 105.

In this example configuration, the partial image binary-coding unit 105 executes a subpixel generating process which increases the number of pixels by interpolating their pixel values for a gray scale image prior to a binary-coding process using the same constant threshold as in Fig. 8 (601). In this process, for example, the linear interpolating process of pixel values is executed.

According to this third example configuration, since a good binary-coding image can be obtained for low-resolution documents, such as those of 150dpi and 100dpi which often exist in a color document image due to the limitation of storage capacity and processing speed, without losing information stored in a gray scale image due to a binary-coding process, far more accurate color document recognition than in the first and second example configurations can be obtained.

Furthermore, a method of changing the size of the local area containing the pixel to be binary-coded of

a gray scale partial image corresponding to a partial area for each partial area using the width of a plotting area contained in the partial area or the size of the partial area itself when a variable threshold to be used for the local binary-coding process described above is obtained, can be considered. If this method is used, when a plotting area with a thick character stroke, such as a title character, etc., is extracted using a local binary-coding process, the occurrence of gray-white-flecked noise can be prevented since all local areas are prevented from being included in the plotting area for a specific pixel, and thus far more accurate color document recognition than in the third example configuration can be realized.

Concrete methods in which the binary image combining unit 106 of the multi-code image binary-coding unit 103 shown in Fig. 2 generates a binary image for the entire gray scale image by combining one or more obtained partial binary images, are as follows.

First, a method in which the binary image combining unit 106 sets the pixel value in a binary image to be outputted, corresponding to a pixel which is not contained in any partial area of a gray scale

image, to the value of a background color, and obtains the pixel value in a binary image to be outputted, corresponding to a pixel which is contained in one or more partial areas of the gray scale image by some operation, such as a logical OR in which corresponding pixel values in a partial binary image obtained from each partial area are combined, etc., can be considered.

A method in which the binary image combining unit 106 assigns a corresponding pixel value in a partial binary image obtained from a top-priority partial area which is determined by the quantitative priority of a partial area, such as the size of a partial area, etc., as a pixel value in a binary image to be outputted, corresponding to a pixel which is contained in one or more partial areas of a gray scale image, can be considered. This method can reduce the possibility of noise combination compared with the previous method, and thus a higher-quality binary image can be generated.

Example processes of the preferred embodiments of the present invention described above are described below.

Fig. 10 shows an example color document at a resolution of 150dpi with a plurality of plotting

colors and a plurality of background colors (No. 1). Fig. 11 shows an example binary-coding result of the example document shown in Fig. 10 according to the conventional apparatus having the configuration shown in Fig. 1. Fig. 12 shows an example partial area extraction (No. 1) of the example document shown in Fig. 10 according to the partial area extracting unit 104 in the preferred embodiment having the configuration shown in Figs. 2 and 6. In Fig. 12, the circumscribed rectangle of the coupling element of an edge in an edge binary image is extracted as a partial area. In Fig. 12, both an edge binary image which can be obtained by executing either a noise removing process (501 in Fig. 6), edge image contracting process (301 in Fig. 6) and ruled-line removing process (401 in Fig. 6) and the aggregate of the circumscribed rectangles representing partial areas overlap.

In Fig. 11 a part of the image in a location where the background color is set apart, is incorrectly extracted as a plotting area, while in Fig.13 there is no such incorrect extraction.

Fig. 13 shows an example binary-coding result of the example document shown in Fig. 10 according to the preferred embodiment of the present invention having

the configuration shown in Figs. 2 and 6. A character area in a color document is excellently extracted. Since ruled lines are removed, only ruled-line information can be outputted as a separate binary image or it can be combined with the main image and outputted, although this is not shown in Fig. 13.

Fig. 14 shows an example color document at a resolution of 150dpi with gradated background color (No. 2). Fig. 15 shows an example binary-coding result of the example document shown in Fig. 14 according to the conventional apparatus having the configuration shown in Fig. 1. Fig. 16 shows an edge strength image after an edge extracting process (201 in Fig. 6) has been performed on the example document shown in Fig. 14 according to the partial area extracting unit 104 in the preferred embodiment of the present invention having the configuration shown in Figs. 2 and 6. Fig. 17 shows an edge binary image after an edge image binary-coding process (202 in Fig. 6) has been performed on the edge strength image. Fig. 18 shows an edge binary image after an edge image contracting process (301 in Fig. 6) has been performed on the edge binary image. Fig. 19 shows an image after a noise removing process (501 in Fig. 6) has been performed on the contracted image. The process order

of 501 and 301 in Fig. 6 can be inverted. Fig. 20 shows an image after a ruled-line removing process (401 in Fig. 6) in which ruled lines have been removed from the image of which the noise is removed. Fig. 21 shows an example partial area extraction after an edge coupling element extracting process (203 in Fig. 6) has been performed on the image of which the ruled lines are removed (No. 2).

In Fig. 15, a part of a background area is incorrectly extracted as a plotting area in a location where background color is gradated, while in Fig. 22, there is no such incorrect extraction after processes shown in Figs. 16 through 21.

Fig. 22 shows an example binary-coding result of the example document shown in Fig. 14 according to the preferred embodiment of the present invention (No. 2). A character area in a color document is excellently extracted. Since ruled lines are removed, only ruled-line information can be outputted as a separate binary image or it can be combined with the main image and outputted, although it is not shown in Fig. 22.

Judging from the process results described above it is found that according to the preferred embodiments of the present invention, high-accuracy color document recognition can be realized.

What is claimed is:

1. An apparatus for recognizing a gray scale image, comprising:

inputting means for inputting a gray scale image; and

multi-code image binary-coding means for converting the inputted gray scale image to a binary image in which each pixel has a value representing either a background area or a plotting area in the gray scale image.

2. An apparatus for recognizing a color document image, comprising:

gray scale image extracting means for extracting a gray scale image from an inputted color document image; and

multi-code image binary-coding means for converting the gray scale image to a binary image in which each pixel has a value representing either a background area or a plotting area in the gray scale image.

3. An apparatus for recognizing a color document image, comprising:

gray scale image extracting means, when an inputted document image is a color document image, for extracting a gray scale image from the color document image; and

multi-code image binary-coding means, when an inputted document image is a color document image, for converting a gray scale image extracted by the gray scale image extracting means to a binary image in which each pixel has a value representing either a background area or a plotting area in the gray scale image, or when an inputted document image is a gray scale image, for converting the gray scale image to a binary image in which each pixel has a value representing either a background area or a plotting area in the gray scale image.

4. The apparatus according to claim 1, further comprising

binary image recognizing means for recognizing a binary image outputted by said multi-code image binary-coding means and electronically coding the binary image.

5. The apparatus according to claim 1, wherein said multi-code image binary-coding means includes

partial area extracting means for one or more partial areas in the gray scale image,

partial image binary-coding means for executing a binary-coding process for each of the partial areas of the gray scale image and extracting a partial binary image, and

binary image combining means for combining the one or more partial binary images and for constituting the binary image of the entire scale image.

6. The apparatus according to claim 5, wherein said binary image combining means sets a pixel value in the binary image to be outputted, corresponding to a pixel which is not contained in any of the partial areas in the gray scale image to a value of a background color.

7. The apparatus according to claim 5, wherein said binary image combining means calculates a pixel value in the binary image to be outputted, corresponding to a pixel which is contained in one or more of the partial areas in the gray scale image, by a logical operation
in which corresponding pixel values in the partial binary images obtained from each partial area are combined.

8. The apparatus according to claim 5, wherein said binary image combining means assigns a corresponding pixel value in the partial binary image obtained from the partial area with top-priority which is determined based on a quantitative priority according to a predetermined criterion as a pixel value in the binary image to be outputted, corresponding to a pixel which is contained in one or more partial areas of the gray scale image.

9. The apparatus according to claim 5, wherein said partial area extracting means extracts one or more partial areas where both background color and plotting color of the gray scale image each have a specific gray scale value.

10. The apparatus according to claim 5, wherein said partial area extracting means outputs one or more rectangular areas as the partial areas.

11. The apparatus according to claim 5, wherein said partial area extracting means extracts one or more partial areas using an edge strength image or edge direction image obtained by executing an edge extracting process for the gray scale image.

12. The apparatus according to claim 11, wherein the edge extracting process is executed using either a Zobel filter or a Laplacian filter.

13. The apparatus according to claim 11, wherein said partial area extracting means calculates an edge binary image representing an outline of a plotting stroke by the edge extracting process and extracting the one or more partial areas based on this edge binary image.

14. The apparatus according to claim 13, wherein said partial area extracting means calculates the edge binary image by executing a binary-coding process for the edge strength image corresponding to the gray scale image.

15. The apparatus according to claim 13, wherein said partial area extracting means calculates said edge binary image of which the edge outline is somewhat contracted by executing a binary-coding process for the edge strength image corresponding to a gray scale image to calculate a temporary edge binary image, shifting each edge pixel of the temporary edge binary image in the forward or backward direction of the edge

direction image to contract the outline formed by the edge pixels.

16. The apparatus according to claim 13, wherein said partial area extracting means calculates coupling elements of the edge element of the edge binary image and calculates each of the partial areas based on each of the coupling elements.

17. The apparatus according to claim 16, wherein said partial area extracting means calculates a circumscribed rectangle of each of the coupling elements as each of the partial areas.

18. The apparatus according to claim 16, wherein said partial area extracting means calculates an overlapping rectangle of a circumscribed rectangle of each of the coupling elements as each partial area.

19. The apparatus according to claim 13, wherein said partial area extracting means judges an extremely long outline from outlines composed of edge pixels in the edge binary image to be a ruled line, removes the extremely long outline and extracts the partial area based on an edge binary image which is composed of

only remaining edge pixels.

20. The apparatus according to claim 19, wherein said partial area extracting means stores and outputs an outline portion judged and removed as the ruled line, as a ruled-line binary image.

21. The apparatus according to claim 20, wherein said binary image combining means performs a logical operation between a binary image generated by said binary image combining means and the ruled-line binary image stored and outputted, and outputs an obtained binary image.

22. The apparatus according to claim 13, wherein said partial area extracting means judges outlines of a predetermined length sequentially arranged in a lateral or vertical direction from outlines composed of edge pixels in the edge binary image to be ruled lines, removes the outlines and extracts the partial area based on an edge binary image which is composed of only remaining edge pixels.

23. The apparatus according to claim 22, wherein said partial area extracting means stores and outputs an

outline portion judged and removed as the ruled line, as a ruled-line binary image.

24. The apparatus according to claim 23, wherein said binary image combining means performs a logical operation between a binary image generated by said binary image combining means and the ruled-line binary image stored and outputted, and outputs an obtained binary image.

25. The apparatus according to claim 13, wherein said partial area extracting means judges an extremely short outline from outlines composed of edge pixels in the edge binary image as noise, removes the outlines and extracts the partial area based on an edge binary image which is composed of only remaining edge pixels.

26. The apparatus according to claim 5, wherein said partial image binary-coding means extracts the partial binary image by executing a binary-coding process for a designated partial area of the gray scale image, based on a single threshold.

27. The apparatus according to claim 26, wherein the

single threshold is determined by calculating a linear sum of mean values, standard deviation and distribution of pixel values in the designated partial area.

28. The apparatus according to claim 5, wherein said partial image binary-coding means roughly extracts a plotting area by executing a binary-coding process for a designated partial area of the gray scale image, based on a single threshold, and extracts the partial binary image by executing a local binary-coding process in which a variable threshold is obtained for each pixel in the plotting area.

29. The apparatus according to claim 28, wherein the single threshold is determined by calculating a linear sum of mean values, standard deviation and distribution of pixel values in the designated local area.

30. The apparatus according to claim 28, wherein the variable threshold is determined by calculating a linear sum of mean values, standard deviation and distribution of pixel values in a local area containing a pixel to be binary-coded in the gray

scale image corresponding to the designated partial area.

31. The apparatus according to claim 30, wherein said partial image binary-coding means changes a size of the local area according to a width of a plotting area contained in the partial area when calculating the variable threshold.

32. The apparatus according to claim 30, wherein said partial image binary-coding means changes a size of the local area according to a size of the partial area when calculating the variable threshold.

33. The apparatus according to claim 5, wherein said partial image binary-coding means calculates a gray scale partial image corresponding to a designated partial area by interpolating a pixel value of the gray scale image and executing a subpixel generating process which increases a number of pixels of an image, and extracts the partial binary image by executing the binary-coding process for the gray scale partial image.

34. The apparatus according to claim 33, wherein the

subpixel generating process includes a linear interpolation process for the pixel value.

35. The apparatus according to claim 33, wherein the variable threshold is determined by calculating a linear sum of mean values, standard deviation and distribution of pixel values in a local area containing a pixel to be binary-coded in the gray scale image corresponding to the designated partial area.

36. The apparatus according to claim 35, wherein said partial image binary-coding means changes a size of the local area according to a width of a plotting area contained in the partial area when calculating the variable threshold.

37. The apparatus according to claim 35, wherein said partial image binary-coding means changes a size of the local area according to a size of the partial area when calculating the variable threshold.

Abstract of the Disclosure

After a gray scale image extracting unit converts an input document image to a gray scale image, a multi-code image binary-coding unit converts the image to a binary image having a value in which each pixel indicates either a background area or a plotting area in the image, and outputs the binary image to a binary image recognizing unit. In the multi-code binary-coding unit, a partial area extracting unit extracts one or more partial areas in the gray scale image. A partial image binary-coding unit executes a binary-coding process for each of the partial areas in the gray scale image. A binary image combining unit combines one or more partial binary images and constitutes a binary image of the entire gray scale image.

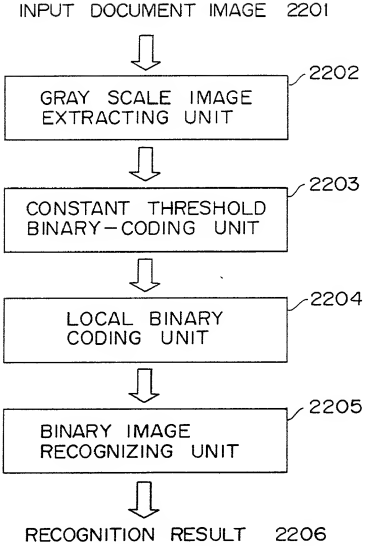


FIG. 1 PRIOR ART

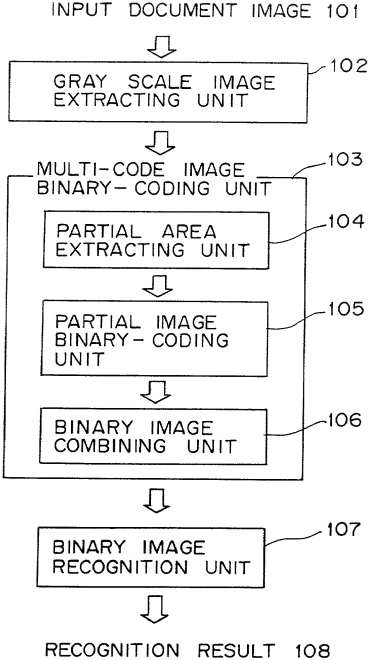

INPUT DOCUMENT IMAGE 101
GRAY SCALE IMAGE EXTRACTING UNIT
102
MULTI-CODE IMAGE BINARY-CODING UNIT
103
PARTIAL AREA EXTRACTING UNIT
104
PARTIAL IMAGE BINARY-CODING UNIT
105
BINARY IMAGE COMBINING UNIT
106
BINARY IMAGE RECOGNITION UNIT
107
RECOGNITION RESULT 108

FIG. 2

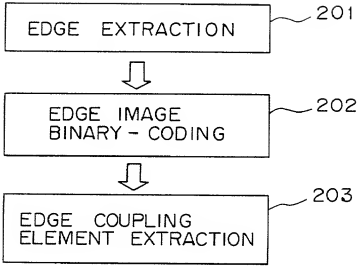

EDGE EXTRACTION
201
EDGE IMAGE BINARY - CODING
202
EDGE COUPLING ELEMENT EXTRACTION
203

FIG. 3

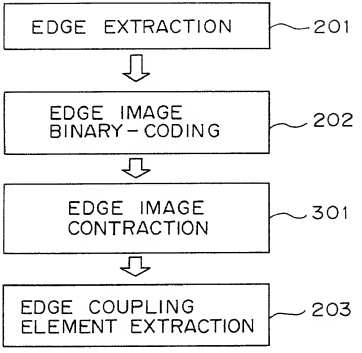

EDGE EXTRACTION
201
EDGE IMAGE BINARY-CODING
202
EDGE IMAGE CONTRACTION
301
EDGE COUPLING ELEMENT EXTRACTION
203

FIG. 4

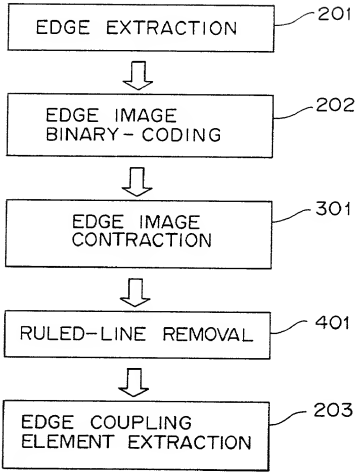

EDGE EXTRACTION
201
EDGE IMAGE BINARY-CODING
202
EDGE IMAGE CONTRACTION
301
RULED-LINE REMOVAL
401
EDGE COUPLING ELEMENT EXTRACTION
203

FIG. 5

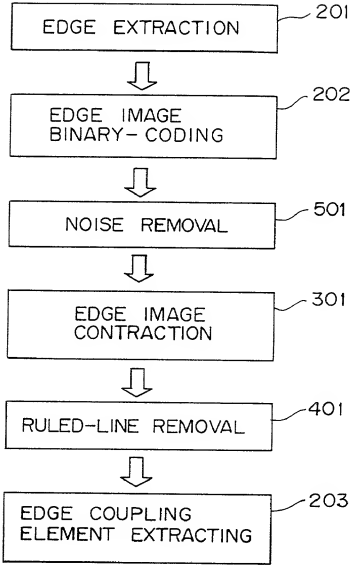

EDGE EXTRACTION
201
EDGE IMAGE BINARY-CODING
202
NOISE REMOVAL
501
EDGE IMAGE CONTRACTION
301
RULED-LINE REMOVAL
401
EDGE COUPLING ELEMENT EXTRACTING
203

FIG. 6

CONSTANT THRESHOLD BINARY-CODING UNIT
601

FIG. 7

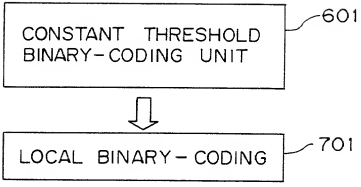

CONSTANT THRESHOLD
BINARY-CODING UNIT
601
LOCAL BINARY-CODING
701

FIG. 8

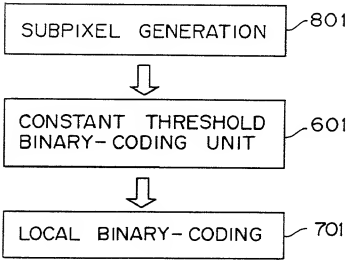
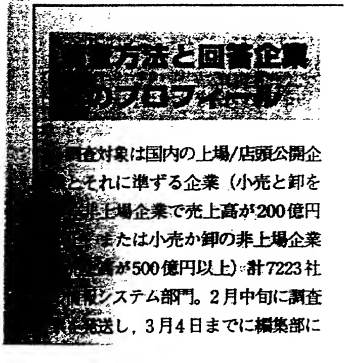

SUBPIXEL GENERATION
801
CONSTANT THRESHOLD
BINARY-CODING UNIT
601
LOCAL BINARY-CODING
701

FIG. 9

導入効果が見えにくい

グループウエアやイントラネットの運営上の課題点としては，エンドユーザーへの教育と，導入による効果が把握しにくいことなどが挙げられた（図26）。

「経営トップの判断で導入に踏み切った」（製造業M社・1000人以上5000人未満）というケースが多いため，グループウエアやイントラネットの導入時には，必ずしも費用対効果の検証を厳しく求められない。ただし「特定部門で導入してから全社的に拡大する段階で，それまでの効果をきちんと測定することが求められる」（金融業N社・500人以上1000人以下）。ワーク・スタイルの改革につながっても，基幹システムのような省力化効果



調査対象は国内の上場/店頭公開企業とそれに準ずる企業（小売と卸を除く非上場企業で売上高が200億円以上，または小売か卸の非上場企業で売上高が500億円以上）計7223社の情報システム部門。2月中旬に調査票を送し，3月4日までに編集部に

FIG. 10

導入効果が見えにくい

グループウエアやイントラネットの運営上の問題点としては，エンドユーザーへの教育と，導入による効果が把握しにくいことなどが挙げられた（図26）。

「経営トップの判断で導入に踏み切った」（製造業M社・1000人以上5000人未満）というケースが多いため，グループウエアやイントラネットの導入時には，必ずしも費用対効果の検証を厳しく求められない。ただし「特定部門で導入してから全社的に拡大する段階で，それまでの効果をきちんと測定することが求められる」（金融業N社・500人以上1000人以下）。ワーク・スタイルの改革につながっても，基幹システムのような省力化効果

調査方法と回答企業のプロフィール

調査対象は国内の上場/店頭公開企業とそれに準ずる企業（小売と卸を除く非上場企業で売上高が200億円以上，または小売か卸の非上場企業で売上高が500億円以上）計7223社の情報システム部門。2月中旬に調査票を発送し，3月4日までに編集部に到着した1960通を有効回答とした。

FIG. 11 PRIOR ART

導入効果が見えにくい

グループウェアやスケジュール管理ツールの運営上の課題としては，ユーザーへの教育と，導入による効果が把握しにくいことなどが考えられた（図表1）。

［経営ツールの判断で導入に踏み込める］［製造業M社・1000人以上5000人未満］グループウェアを多くの企業，グループウェアやスケジュール管理ツールの導入時には，必ずしも費用対効果の把握を重視する必要はない。まずは特定部門で導入してから全社的に拡大する段階で，それまでの効果を評価し判定することが求められる。［金融業N社・500人以上1000人以下］グループウェアの改革につながっており，基幹システムのように明確な効果

調査の方法と回答企業のプロフィール

調査対象は国内の上場/店頭公開企業それぞれに属する企業（IR情報を開示している企業で売上高が100億円以上の企業）。上場企業では売上高が500億円以上の1723社の情報システム部門長，2月中旬に調査票を郵送し，3月末日までに返送された有効回答をもとに，

FIG. 12

導入効果が見えにくい

グループウエアやイントラネットの運営上の課題点としては，エンドユーザーへの教育と，導入による効果が把握しにくいことなどが挙げられた（図26）。

「経営トップの判断で導入に踏み切った」（製造業M社・1000人以上5000人未満）というケースが多いため，グループウエアやイントラネットの導入時には，必ずしも費用対効果の検証を厳しく求められない。ただし「特定部門で導入してから全社的に拡大する段階で，それまでの効果をきちんと測定することが求められる」（金融業N社・500人以上1000人以下）。ワーク・スタイルの改革につながっても，基幹システムのような省力化効果

調査方法と回答企業のプロフィール

調査対象は国内の上場/店頭公開企業とそれに準ずる企業（小売と卸を除く非上場企業で売上高が200億円以上，または小売か卸の非上場企業で売上高が500億円以上）計7223社の情報システム部門。2月中旬に調査票を発送し，3月4日までに編集部に到着した1960通を有効回答とした。

FIG. 13

め，顧客やビジネスの情報がたくさん集まって来る。SEマネジャは，各SEがこれらの情報を仕事に活用し本人の能力を向上できるように，支援する必要がある。

ければ，とても部下を引っ張ることはできない。

SEマネジャは忙しいが，それにかまけて「SEマネジャだけに来た情報」を処理しないようでは，マネジャとして失格である。紙で伝達していた時代なら，「書類の小山」ができるので，自分あるいは部下が情報の滞留に気がつくことができた。だが，電子情報時代になると，マネジャが自分で情報を取りに行き，内容を確認しない限り，「電子情報の小山」ができていることにだれも気がつかない。

SEマネジャがルーズだったり，情報を処理する能力がないと部下が非常に困る。SEマネジャに来た情報を，マネジャがつい忘れて部下に知らせなかったり，数日たってからようやく伝達したのでは，部下はたまったものではない。まさに「人災」である。SEマネジャは，自分のところに来る情報は組織のものであり，自分だけのものではない，と言うことを忘れてはならない。

しかも，情報を即座にSEに渡すだけでは不十分である。忙しいSEにとって，不要な情報，すなわち現在の仕事に直接関係がない電子メールや回覧物ほど邪魔になるものはない。したがって，SEマネジャは各種の情報のうち，該当するSEに関連するものだけを知らせるべきである。

ここで忘れてはならないのは，SEマネジャが自分のコメントを情報に付けて伝達することである。特に，若いSEに対しては，教育にもなるのでコメントの記入をおろそかにはできない。

コメントは一般論ではなく，できる限り具体的に書く必要がある。伝達する情報が，どの顧客に関係するのか，どの分野に適用できそうだとか，このトラブルには要注意だとか，社内の走り上げ計上基準が変わったから気をつけるように，といった程度まで書いたほうがよい。

SEが見落とさないように指導

さらに，SEマネジャは「全SEに来た情報」であっても，自分でざっと目を通し，重要な情報については，関係するSEにコメント付きで知らせる必要がある。

現在は，情報を「自分できちんと取りに行くSE」と「そうでないSE」との間で，能力や技術力に格差がつきやすい時代だからである。こうした格差が出てきては，まともなシステム開発やセールス活動ができない。

FIG. 14

[illegible] 顧客や上司の情報は、SEマネジャのところに集まってくる。特に顧客に関する情報は、SEマネジャが一番よく知っているはずである。自分の意見を必ず添える」べきである。SEマネジャはSE時代の経験をもとに、顧客やビジネスの情報がたくさん集まって来る。SEマネジャは、各SEがこれらの情報を仕事に活用し本人の能力を向上できるように、支援する必要がある。

ければ，とても部下を引っ張ることはできない。

SEマネジャは忙しいが，それにかまけて「SEマネジャだけに来た情報」を処理しないようでは，マネジャとして失格である。紙で伝達していた時代なら，「書類の小山」ができるので，自分あるいは部下が情報の滞留に気がつくことができた。だが，電子情報時代になると，マネジャが自分で情報を取りに行き，内容を確認しない限り，「電子情報の小山」ができていることにだれも気がつかない。

SEマネジャがルーズだったり，情報を処理する能力がないと部下が非常に困る。SEマネジャに来た情報を，マネジャがついうっかりして部下に知らせなかったり，数日たってからようやく伝達したのでは，部下はたまったものではない。まさに「人災」である。SEマネジャは，自分のところに来る情報は組織のものであり，自分だけのものではない，と言うことも忘れてはならない。

しかも，情報を即座にSEに渡すだけでは不十分である。忙しいSEにとって，不要な情報，すなわち現在の仕事に直接関係がない電子メールや回覧物ほど邪魔になるものはない。したがって，SEマネジャは多種の情報のうち，該当するSEに関連するものだけを知らせるべきである。

ここで忘れてはならないのは，SEマネジャが自分のコメントを情報に付けて伝達することである。特に，若いSEに対しては，教育にもなるのでコメントの記入をおろそかにはできない。

コメントは一般論ではなく，できる限り具体的に書く必要がある。伝達する情報が，どの顧客に関係するのか，どの分野に適用できそうだとか，このトラブルには要注意だとか，社内の売り上げ計上基準が変わったから気をつけるように，といった程度まで書いたほうがよい。

SEが見落とさないように指導

さらに，SEマネジャは「全SEに来た情報」であっても，自分でざっと目を通し，重要な情報については，関係するSEにコメント付きで知らせる必要がある。

現在は，情報を「自分できちんと取りに行くSE」と「そうでないSE」との間で，能力や技術力に格差がつきやすい時代だからである。こうした格差が出てきては，まともなシステム開発やチームワークができない。

FIG. 15 PRIOR ART

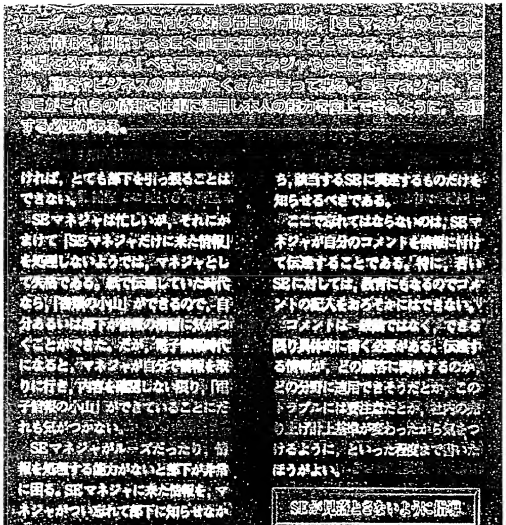


FIG. 16

リーダーシップなどに代表される個人の行動に「SEマネジメントのところに良い情報が、即時に集まるSEの組織に変えることである。しかも「SEの感性を磨かせる」ことである。SEマネジメントでは、予算管理はもとより、個別プロジェクトの管理がたくさん出てくる。SEマネジャは、各SEがこれらの情報を的確に活用し、個人の能力を向上できるように、支援する役割がある。

ければ，とても部下を引っ張ることはできない。

SEマネジャは忙しいが，それにかまけて「SEマネジャだけに来た情報」を処理しないようでは，マネジャとして失格である。紙で伝達していた時代なら「情報の小山」ができるので，自分あるいは部下が情報の増量に気がつくことができた。だが，電子情報時代になると，マネジャが自分で情報を取りに行き，内容を確認しない限り，「電子情報の小山」ができていることにだれも気がつかない。

SEマネジャがルーズだったり，情報を処理する能力がないと部下が非常に困る。SEマネジャに来た情報を，マネジャがつい忘れて部下に知らせなかったり，数日たってからようやく伝達したのでは，部下はたまったものではない。まさに「人災」である。SEマネジャは，自分のところに来る情報は組織のものであり，自分だけのものではない，と肝ることを忘れてはならない。

しかも，情報を現場にSEに渡すだけでは不十分である。忙しいSEにとって，不要な情報，すなわち現在の仕事に直接関係がない電子メールや社内情報などは情報になるものではない。したがって，SEマネジャは多種の情報のうち，該当するSEに関連するものだけを知らせるべきである。

ここで忘れてはならないのは，SEマネジャが自分のコメントを情報に付けて伝達することである。特に，若いSEに対しては，教育にもなるのでコメントの重大をおろそかにはできない。

コメントは一般論ではなく，できる限り具体的に書く必要がある。伝達する情報が，どの顧客に関係するのか，どの分野に適用できそうだとか，このトラブルには要注意だとか，社内の取り引き上基準が変わったから気をつけるように，といった観点まで書いたほうがよい。

SEが見逃さないように指導

さらに，SEマネジャは「全SEに来た情報」であっても，自分でざっと目を通し，重要な情報については，関係するSEにコメント付きで知らせる必要がある。

実は，情報を「自分でちゃんと取りに行くSE」と「そうでないSE」との間で，能力や技術に格差がつきやすい時代だからである。ざっと目を通すだけでは，全ともなるとマネジメントや営業やセールス活動ができなくなる。

FIG. 17

リーダーシップなどに代表される指導業務の他に、「SEマネジャのところに来た情報を、適切なSEへ最適に振り分けること」である。しかも「部分の総和を超える」べきである。SEマネジャやSEには、技術情報をはじめ、顧客やビジネスの情報がとくに必要である。SEマネジャは、各SEがこれらの情報を仕事に活用しない人の能力を向上できるように、支援する必要がある。

ければ，とても部下を引き張ることはできない。

「SEマネジャは忙しいが，それにかまけて「SEマネジャ宛に来た情報」を処理しないようでは，マネジャとして失格である。彼で伝達していた時代なら，「情報の小山」ができるので，自分あるいは部下が情報の溜まりに気がつくことができた。だが，電子情報時代になると，マネジャが自分で情報を取りに行き，内容を確認しない限り，「電子情報の小山」ができていることにだれも気がつかない。

SEマネジャがルーズだったり，情報を処理する能力がないと部下が非常に困る。SEマネジャに来た情報を，マネジャがつい忘れて部下に知らせなかったり，数日たってからようやく伝達したのでは，部下はたまったものではない。まさに「人災」である。SEマネジャは，自分のところに来る情報は組織のものであり，自分だけのものではない，と言うことを忘れてはならない。

しかも，情報を単純にSEに渡すだけでは不十分である。忙しいSEにとって，不要な情報，すなわち現在の仕事に直接関係がない電子メールや回覧物まで読むことになるものはない。したがって，SEマネジャは各種の情報のうち，該当するSEに関連するものだけを知らせるべきである。

ここで忘れてはならないのは，SEマネジャが自分のコメントを情報に付けて伝達することである。特に，若いSEに対しては，教育にもなるのでコメントの記入をおろそかにはできない。

コメントは一般論ではなく，できる限り具体的に書く必要がある。伝達する情報が，どの顧客に関係するのか，どの分野に適用できそうか，などが，このトラブルには要注意だとか，社内の振り上げ指針基準が変わったから気をつけるように，という程度まで書いたほうがよい。

SEが見過ごさないように指導

さらに，SEマネジャは「全SEに来た情報」であっても，自分でざっと目を通し，重要な情報については，関係するSEにコメント付きで知らせる必要がある。

現在は，情報を「自分できちんと取りに行く SE」と「そうでない SE」との間で，能力や技術以外に格差がつきやすい時代だからである。どうした格差が出てきては，まともなシステム開発やセールス活動ができない。

FIG. 18

リーダーシップ発揮に対する適当な回答の例は、「SEマネジャのところに来た情報を、確認するSEへ適切に振り分ける」ことである。しかも「振分の基準をみつけろ」べきである。SEマネジャやSEには、技術情報をはじめ、顧客やビジネスの情報がたくさん集まってくる。SEマネジャは、各SEがこれらの情報を仕事に活用し本人の能力を向上できるように、支援する必要がある。

ければ，とても部下を引っ張ることはできない。

SEマネジャは忙しいが，それにかまけて「SEマネジャだけに来た情報」を処理しないようでは，マネジャとして失格である。紙で伝達していた時代なら，「書類の小山」ができるので，自分あるいは部下が情報の滞留に気がつくことができた。だが，電子情報時代になると，マネジャが自分で情報を取りに行き，内容を確認しない限り，「電子情報の小山」ができていることにだれも気がつかない。

SEマネジャがルーズだったり，情報を処理する能力がないと部下が非常に困る。SEマネジャに来た情報を，マネジャがつい忘れて部下に知らせなかったり，数日たってからようやく伝達したのでは，部下はたまったものではない。まさに「人災」である。SEマネジャは，自分のところに来る情報は組織のものであり，自分だけのものではない，と言うことを忘れてはならない。

しかも，情報を同時にSEに渡すだけでは不十分である。忙しいSEにとって，不要な情報，すなわち現在の仕事に直接関係がない電子メールや回覧物ほど邪魔になるものはない。したがって，SEマネジャは各種の情報のうち，該当するSEに関連するものだけを知らせるべきである。

ここで忘れてはならないのは，SEマネジャが自分のコメントを情報に付けて伝達することである。特に，若いSEに対しては，教育にもなるのでコメントの記入をおろそかにはできない。

コメントは一般論ではなく，できる限り具体的に書く必要がある。伝達する情報が，どの顧客に関係するのか，どの分野に適用できそうだとか，このトラブルには要注意だとか，社内の売り上げ計上基準が変わったから気をつけるように，といった程度まで書いたほうがよい。

SEが見過ごさないように指導

さらに，SEマネジャは「全SEに来た情報」であっても，自分でざっと目を通し，重要な情報については，関係するSEにコメント付きで知らせる必要がある。

現在は，情報を「自分できちんと取りに行くSE」と「そうでないSE」との間で，能力や経験力に格差がつきやすい時代だからである。こうした格差が広がってしまっては，まともなシステム開発やセールス活動ができない。

FIG. 19

リーダーシップを発揮する時間帯の問題は，「SEマネジャのところに来た情報は，翌朝までにSE一人一人に知らせる」ことである。しかし「自分の意見をみんなに伝える」べきである。SEマネジャやSEに比べ，技術情報をはじめ，顧客やビジネスの情報がたくさん集まってくる。SEマネジャは，全SEがこれらの情報を仕事に活用し本人の能力を向上できるように，支援する必要がある。

ければ，とても部下を引っ張ることはできない。

SEマネジャは忙しいが，それにかまけて「SEマネジャだけに来た情報」を処理しないようでは，マネジャとして失格である。紙で伝達していた時代なら，「書類の小山」ができるので，自分あるいは部下が情報の滞留に気がつくことができた。だが，電子情報時代になると，マネジャが自分で情報を取りに行き，内容を確認しない限り，「電子情報の小山」ができていることにだれも気がつかない。

SEマネジャがルーズだったり，情報を処理する能力がないと部下が非常に困る。SEマネジャに来た情報を，マネジャが つい忘れて部下に知らせなかったり，数日たってからようやく伝達したのでは，部下はたまったものではない。まさに「人災」である。SEマネジャは，自分のところに来る情報は組織のものであり，自分だけのものではない，と言うことを忘れてはならない。

しかも，情報を即座にSEに渡すだけでは不十分である。忙しいSEにとって，不要な情報，すなわち現在の仕事に直接関係がない電子メールや回覧物ほど邪魔になるものはない。したがって，SEマネジャは各種の情報のうち，該当するSEに関連するものだけを知らせるべきである。

ここで忘れてはならないのは，SEマネジャが自分のコメントを情報に付けて伝達することである。特に，若いSEに対しては，教育にもなるのでコメントの記入をおろそかにはできない。

コメントは一般論ではなく，できる限り具体的に書く必要がある。伝達する情報が，どの顧客に関係するのか，どの分野に適用できそうだとか，このトラブルには要注意だとか，社内の売り上げ計上基準が変わったから気をつけるように，といった程度まで書いたほうがよい。

SEが見過ごさないように指導

さらに，SEマネジャは「全SEに来た情報」であっても，自分でざっと目を通し，重要な情報については，関係するSEにコメント付きで知らせる必要がある。

現在は，情報を「自分できちんと取りに行くSE」と「そうでないSE」との間で，能力や技術力に格差がつきやすい時代だからである。ひとたび格差が出てきては，まともなシステム開発やセールス活動ができない。

FIG. 20

リーダーシップを身に付ける第1番目の行動は，「SEマネジャのところに来た情報を，即座するSEへ即座に知らせる」ことである。なぜなら「自分の意識を変える」べきである。SEマネジャやSEには，技術情報をはじめ，顧客やビジネスの情報がたくさん集まって来る。SEマネジャは，各SEがこれらの情報を仕事に活用して本人の能力を向上できるように，支援する必要がある。

行れは，次の部下を引っ張るときである。

SEマネジャは，それに対して「SEマネジャに来た情報」処理に追われ，マネジャとして疲弊する。逆で伝達しない時代は，「伝聞の神」ができるので，自分は「伝聞の神様の指令に気がつくときがある。また，電子情報時代には，マネジャが自分で情報処理を行い，内容を確認してから，「電子情報の神」ができないようにしなければならない。

SEマネジャはルーティンワークを，情報処理する能力の高い部下の分野に任せる。SEマネジャに来た情報は，マネジャが「受けて終了」と知らせるかぎり，最後まで責任を持って伝達するので，部下はきちんと行うのである。重要な「人事」である。SEマネジャは，自分のところに来た情報は組織のものであり，自分だけのものではない，と認識することが重要である。

次に，情報を即座にSEに知らせるためにはどうすればよいか，「SEマネジャに，不要な情報，すなわち現在の仕事に直接関係のない電子メールや社内連絡網からの電子メールを，どれだけ減らすことができるか」である。これによって，SEマネジャに必要な情報のみを，該当するSEに関連する人のみが知らせることである。

ここで忘れてはならないのは，SEマネジャ自分のところに情報に対する伝達である。最後に，各SEに対しては，最後に自分のところの人間的なタッチにすることである。

このタッチは，「教育ではなく，できるだけ具体的な言葉」が必要である。伝達する情報が，どの顧客に関係するのか，どの分野に適用できるのか，各SEプロフィールは要注意である。社内の売り上げ目標などを，どのように気をつけるべきか，ということを常時伝えることが必要である。

SEの関係者に対する情報

さらに，SEマネジャは「各SEに来た情報」である。自分にとって重要な情報については，顧客がSEにとって「秘密」であるべき必要がある。

現在は，顧客が「自分でSEの役割を行う」SEと「自分ではSE」との間で，最近情報が「顧客から直接」増えてきている。この顧客の増加は，SEマネジャの活動である。

0077207 2002-11-19

FIG. 21

リーダーシップを身に付ける第8番目の行動は，「SEマネジャのところに来た情報を，関係するSEへ即座に知らせる」ことである。しかも「自分の意見をあえて添える」べきである。SEマネジャやSEには，技術情報をはじめ，顧客やビジネスの情報がたくさん集まって来る。SEマネジャは，各SEがこれらの情報を仕事に活用し本人の能力を向上できるように，支援する必要がある。

ければ，とても部下を引っ張ることはできない。

SEマネジャは忙しいが，それにかまけて「SEマネジャだけに来た情報」を処理しないようでは，マネジャとして失格である。紙で伝達していた時代なら，「書類の小山」ができるので，自分あるいは部下が情報の滞留に気がつくことができた。だが，電子情報時代になると，マネジャが自分で情報を取りに行き，内容を確認しない限り，「電子情報の小山」ができていることにだれも気がつかない。

SEマネジャがルーズだったり，情報を処理する能力がないと部下が非常に困る。SEマネジャに来た情報を，マネジャがつい忘れて部下に知らせなかったり，数日たってからようやく伝達したのでは，部下はたまったものではない。まさに「人災」である。SEマネジャは，自分のところに来る情報は組織のものであり，自分だけのものではない，と言うことを忘れてはならない。

しかも，情報を即座にSEに渡すだけでは不十分である。忙しいSEにとって，不要な情報，すなわち現在の仕事に直接関係がない電子メールや郵便物ほど邪魔になるものはない。したがち，該当するSEに関連するものだけを知らせるべきである。

ここで忘れてはならないのは，SEマネジャが自分のコメントを情報に付けて伝達することである。特に，若いSEに対しては，教育にもなるのでコメントの記入をおろそかにはできない。

コメントは一般論ではなく，できる限り具体的に書く必要がある。伝達する情報が，どの顧客に関係するのか，どの分野に適用できそうだとか，このトラブルには要注意だとか，社内の売り上げ計上基準が変わったから気をつけるように，といった程度まで書いたほうがよい。

SEが見落とさないように指導

さらに，SEマネジャは「全SEに来た情報」であっても，自分でざっと目を通し，重要な情報については，関係するSEにコメント付きで知らせる必要がある。

現在は，情報を「自分できちんと取りに行くSE」と「そうでないSE」との間で，能力や技術力に格差がつきやすい時代だからである。こうした格差が出てきては，まともなシステム開発

0077277 2000

FIG. 22

PTO/SB/105 (6-95)
Approved for use through 9/30/98. OMB 0651-0032
Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Declaration and Power of Attorney For Patent Application

特許出願宣言書及び委任状

Japanese Language Declaration

日本語宣言書

下記の氏名の発明者として、私は以下の通り宣言します。

As a below named inventor, I hereby declare that:

私の住所、私書箱、国籍は下記の私の氏名の後に記載された通りです。

My residence, post office address and citizenship are as stated next to my name.

下記の名称の発明に関して請求範囲に記載され、特許出願している発明内容について、私が最初かつ唯一の発明者（下記の氏名が一つの場合）もしくは最初かつ共同発明者であると（下記の名称が複数の場合）信じています。

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

COLOR DOCUMENT IMAGE RECOGNIZING APPARATUS

上記発明の明細書（下記の欄でx印がついていない場合は、本書に添付）は、

the specification of which is attached hereto unless the following box is checked:

☐ __月__日に提出され、米国出願番号または特許協定条約国際出願番号を_____とし、
（該当する場合）_____ に訂正されました。

☐ was filed on _____
as United States Application Number or
PCT International Application Number
_____ and was amended on
_____ (if applicable).

私は、特許請求範囲を含む上記訂正後の明細書を検討し、内容を理解していることをここに表明します。

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

私は、連邦規則法典第３７編第１条５６項に定義されるとおり、特許資格の有無について重要な情報を開示する義務があることを認めます。

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

Burden Hour Statement: This form is estimated to take 0.4 hours to complete. Time will vary depending upon the needs of the individual case. Any comments on the amount of time you are required to complete this form should be sent to the Chief Information Officer, Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner of Patents and Trademarks, Washington, DC 20231.

Japanese Language Declaration
(日本語宣言書)

私は、米国法典第３５編１１９条 (a) - (d) 項又は３６５条 (b) 項に基き下記の、米国以外の国の少なくとも一ヵ国を指定している特許協力条約３６５ (a) 項に基づく国際出願、又は外国での特許出願もしくは発明者証の出願についての外国優先権をここに主張するとともに、優先権を主張している、本出願の前に出願された特許または発明者証の外国出願を以下に、枠内をマークすることで、示しています。

I hereby claim foreign priority under Title 35, United States Code, Section 119 (a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)
外国での先行出願

(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願年月日)	Priority Not Claimed 優先権主張なし
10-353045	Japan	11th/December/1998	☐
			☐

私は、第３５編米国法典１１９条 (e) 項に基いて下記の米国特許出願規定に記載された権利をここに主張いたします。

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below.

(Application No.) (出願番号)	(Filing Date) (出願日)

私は、下記の米国法典第３５編１２０条に基いて下記の米国特許出願に記載された権利、又は米国を指定している特許協力条約３６５条 (c) に基づく権利をここに主張します。また、本出願の各請求範囲の内容が米国法典第３５編１１２条第１項又は特許協力条約で規定された方法で先行する米国特許出願に開示されていない限り、その先行米国出願書提出日以降で本出願書の日本国内または特許協力条約国際提出日までの期間中に入手された、連邦規則法典第３７編１条５６項で定義された特許資格の有無に関する重要な情報について開示義務があることを認識しています。

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s), or 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code Section 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of application.

(Application No.) (出願番号)	(Filing Date) (出願日)	(Status: Patented, Pending, Abandoned) (現況：特許許可済、係属中、放棄済)
(Application No.) (出願番号)	(Filing Date) (出願日)	(Status: Patented, Pending, Abandoned) (現況：特許許可済、係属中、放棄済)

私は、私自身の知識に基づいて本宣言書中で私が行なう表明が真実であり、かつ私の入手した情報と私の信じるところに基づく表明が全て真実であると信じていること、さらに故意になされた虚偽の表明及びそれと同等の行為は米国法典第１８編第１００１条に基づき、罰金または拘禁、もしくはその両方により処罰されること、そしてそのような故意による虚偽の声明を行なえば、出願した、又は既に許可された特許の有効性が失われることを認識し、よってここに下記のごとく宣誓を致します。

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

PTO/SB/106 (8-96)
Approved for use through 9/30/98. OMB 0651-0032
Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Japanese Language Declaration
(日本語宣言書)

委任状： 私は下記の発明者として、本出願に関する一切の手続きを米特許商標局に対して遂行する弁理士または代理人として、下記の者を指名いたします。（弁護士、または代理人の氏名及び登録番号を明記のこと）

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith *(list name and registration number)*

James D. Halsey, Jr., 22,729; Harry John Staas, 22,010; David M. Pitcher, 25,908; John C. Garvey, 28,607; J. Randall Beckers, 30,358; William F. Herbert, 31,024; Richard A. Gollhofer, 31,106; Mark J. Henry, 36,162; Gene M. Garner II, 34,172; Michael D. Stein, 37,240; Paul I. Kravetz, 35,230; Gerald P. Joyce, III, 37,648; Todd E. Marlette, 35,269; Harlan B. Williams, Jr., 34,756; George N. Stevens, 36,938; Michael C. Soldner, 41,455; Norman L. Ourada, 41,235; Kevin R. Spivak, P-43,148; and William M. Schertler, 35,348 (agent)

書類送付先

Send Correspondence to:

STAAS & HALSEY
700 Eleventh Street, N.W.
Suite 500
Washington, D.C. 20001

直接電話連絡先： （名前及び電話番号）

Direct Telephone Calls to: *(name and telephone number)*

STAAS & HALSEY
(202) 434-1500

唯一または第一発明者名	**Full name of sole or first inventor** Katsuhito FUJIMOTO
発明者の署名 日付	**Inventor's signature** Katsuhito Fujimoto **Date** July 2, 1999
住所	**Residence** Kanagawa, Japan
国籍	**Citizenship** Japan
私書箱	**Post Office Address** c/o FUJITSU LIMITED, 1-1, Kamikodanaka
	4-chome, Nakahara-ku, Kawasaki-shi, Kanagawa 211-8588, Japan
第二共同発明者	**Full name of second joint inventor, if any** Hiroshi KAMADA
第二共同発明者 日付	**Second inventor's signature** Hiroshi Kamada **Date** July 2, 1999
住所	**Residence** Kanagawa, Japan
国籍	**Citizenship** Japan
私書箱	**Post Office Address** c/o FUJITSU LIMITED, 1-1, Kamikodanaka
	4-chome, Nakahara-ku, Kawasaki-shi, Kanagawa 211-8588, Japan

（第三以降の共同発明者についても同様に記載し、署名をすること）

(Supply similar information and signature for third and subsequent joint inventors.)